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Welfare Capitalism in Post-Industrial Times: Trilemma or Power Over Rents?

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Abstract

The structure of 'post-industrial' economies is widely held to be problematic for welfare capitalism, because of inherent limits to productivity growth in services compared to manufacturing. The so-called 'post-industrial trilemma' is suggested to allow only two of relative earnings equality, high levels of employment and fiscal balance, and has resulted in the widespread policy belief that greater earnings inequality and welfare-state retrenchment are unavoidable. This article challenges the micro-foundations of this understanding, that the production of economic value is technologically determined by the physical properties inherent in goods and services. In contrast, we argue theoretically, and demonstrate empirically, that production, allocation and distribution are contingent processes better conceived in terms of 'power over rents' with associated externalities between sectors. Our analysis suggests that the post-industrial trilemma thesis may have unduly distracted research from the potential for redistributive politics to achieve sustainable levels of productivity growth, fiscal balance and higher levels of earnings equality.

Keywords: welfare state, work, wages, production markets, labour markets, socio-economics

1. Introduction

Well before post-financial crisis politics of austerity, it had become widely accepted that 'post-industrialism' poses irresistible challenges to welfare capitalism. Since productivity growth in services has not historically matched that in manufacturing, pressure emerges for more moderate and unequal inter-sectoral wage settlements. Furthermore, as services become a larger component of developed economies, real income and productivity growth decline and constrain welfare state funding. This essential problem of welfare capitalism has been understood as the 'post-industrial trilemma': Only two of high employment, earnings equality and fiscal balance are seen as achievable. It shapes *a priori* descriptions and problem formulation for research and policy and has thus reached the status of 'normal science' (Jenson & Saint-Martin, 2005; Kuhn, 1962: 24, 46-47).

However, there are profound problems with the micro-foundations of the trilemma. Physical 'real' productivity growth and 'nominal' productivity growth are conflated and overly strong assumptions are made that gains are confined to the sector where real productivity growth occurs. This paper challenges this deterministic iron law understanding of the relationship between productivity and wages and its conclusions for welfare capitalism. We argue theoretically, and demonstrate empirically, that production, allocation and distribution are more contingent processes better conceived in terms of power over rents, with associated externalities between sectors. The implication is that the post-industrial trilemma thesis may unduly have distracted research from old-fashioned questions about how redistribution may contribute *inter alia* to productivity-growth and the modification of market-determined outcomes.

The article first specifies the stakes for welfare capitalism in the post-industrial trilemma. Its theoretical foundations are then critically reviewed. Thirdly, empirical evidence is presented on the relationship between real productivity, prices, nominal productivity and average labour compensation in 23 industries for 29 OECD countries over thirty seven years. Finally, we discuss the implications of our findings.

2. The Post-Industrial Trilemma and Welfare Capitalism

The post-industrial trilemma thesis had captured welfare state research by the end of the 1990s. Kitschelt (2001) referred to it to substantiate the assertion that Keynesianism had become anachronistic. It provided scientific aura to the Third Way, which saw welfare retrenchment, workfare, and wage restraint as the key responses to ‘new social risks’ and provided an intellectual reference-point for the EU’s Lisbon Agenda (e.g. Bonoli 2005; Esping-Andersen 1996; 2000; 2002; Taylor-Gooby 2004). Whilst events have taken us beyond the Third Way and Lisbon, the post-industrial trilemma has broader appeal and still very much informs current research and policy deliberations on topics such as distribution and growth, social policy and welfare reform, dualisation and insider-outsider dynamics on labour markets, and, via the concept of ‘new social risks’, attendant implications on social structure and politics (e.g. Bonoli 2007; Häusermann, 2010; Schwander & Häusermann, 2013; Wren, 2013; Beramendi et. al., 2015).

Pierson (1995; 2001) and Iversen & Wren (1998) are not only among the most articulate formulations of the post-industrial trilemma, theirs are arguably what Kuhn called the ‘foundational works’ of the present paradigm that ‘implicitly define the legitimate problems and methods of a research field for succeeding generations’, and hence these works are the

focus of our critique. Whereas Iversen & Wren offer a more fine-grained account of its economics, Pierson outlines the broader problems for the welfare state. Services are by their essential nature held to be unable to match the continuous productivity increases in manufacturing, because in services 'it is essentially the labour effort itself we wish to consume' (Pierson, 2001: 84). There are limits to how many clients a banker can serve, how many patients a nurse can nurse, and how many haircuts a hairdresser can cut that do not apply to manufacturing under technological change. Consequently, in an increasingly service-based economy, employment can only expand through low wages as has been the case in the Anglo-Saxon 'residual' welfare states, resulting in increases of inequality. Wage-compression can – as in most continental European 'Christian democratic' welfare states – be 'artificially' maintained through corporatist arrangements. But this results in lower employment-levels as cost barriers to new service employment become high. A vicious circle arises as increased outlays on pensions and unemployment insurance increase payroll surcharges, hence accentuating the problem of high labour costs. Alternatively, as in Scandinavian 'social democratic' welfare states, wage-compression and service-employment may be reconciled through public social service provision. But because of the gap in productivity growth, wage equality can only be maintained if relative prices/costs of public services increase. This entails a continuous commitment to tax increases. As the willingness to pay taxes reaches its limits, such service employment can ultimately only be maintained through increased budget deficits or inflation (Iversen & Wren, 1998: 512-13). Wren et al. have nuanced this trilemma in more recent work (2013), through the addition of a 'dynamic service sector'. However, they retain the same underlying theoretical framework which we take issue with and which continues to be widely influential (see section 3.2).

Pierson extrapolates from these micro foundations a broader macro-level necessity for welfare state retrenchment. Welfare states have supposedly entered a phase of 'maturity' characterised by deep-structural stagnation independent of globalisation. Hence even if 'economic openness [had] remained constant over the past quarter-century, governments would nonetheless face increasing inflexibility and intense fiscal pressure, including tendencies towards deficit spending and demands for programme cutbacks and policy reform' (Pierson, 2001: 83-87).

Pierson's argument faces, however, some considerable anomalies. Empirically observed stylized facts, demonstrating that long-run per capita real growth has been stable, do not accord with secular decline (Herrendorf et. al., 2014). Furthermore, Häusermann's and Palier's (2008: esp. 569-71) extensive review of employment-friendly welfare reforms in post-industrial economies find that the crisis predicted for the Scandinavian social democratic regime has not happened. Whilst comprehensive tax reforms have reduced marginal tax rates on incomes these have not generated deficits. Reduced rates have been counteracted through a broadening of the tax base via eliminations of deductions and write-off rules (Steinmo, 2002: 850), while employment rates remain very high. The future of the social democratic regime, they conclude, is more a question of political agency than socio-economic structure (see also Bonoli, 2007). This analysis is in accord with ours. But why is the bumble-bee still flying? Though Häusermann and Palier present the iron-law with a macro-level empirical anomaly, they do not follow through with a challenge to its micro-level theoretical foundations. That is exactly what we do, hence contributing to understanding how the fiscal, employment and wage structure outcomes implied by Häusermann's and Palier's findings are possible whilst being ruled out by the post-industrial trilemma. We do this first by unpacking the theoretical foundations of post-industrialism

and critically situating them alongside those of alternative theories, before empirically examining the evidence for them.

3. Post-Industrialism in Theory

3.1 Neoclassical Theory

The post-industrial trilemma thesis differs from competitive neoclassical economics. Here the determination of rewards is not specific to industry or sector, but varies by human capital (e.g. Varian, 1993: 386). Productivity increases in any one sector benefit *all* workers as consumers, since rewards to productive inputs are determined at the aggregate level.

Capital and labour have their returns (costs to firms) and corresponding marginal value products determined in economy-wide factor markets. Output prices are determined in product markets large enough to be immune from decisions in any one firm. Every firm in every industry optimises profitability by employing a quantity of each factor input so that marginal cost equals marginal value. If one firm increases its labour productivity, perhaps through technological innovation, it produces more physical units per worker. In understanding attendant consequences, neoclassical theory jumps to the next equilibrium. Here, factor markets are largely unaffected since aggregate supply and demand for labour and capital largely remain the same. Hence, nominal wages, return on capital and corresponding marginal value products are unchanged. Innovations are rapidly copied across the industry, or adopted by new entrants. The significant change in the new equilibrium is a lower price, with the increased productivity passed on as savings to consumers.

The 'real product wage' of workers in the sector, that is the number of units of directly produced output that their money wage can purchase, increases according to the increase in productivity, though the nominal wage is unchanged. The 'real consumption wage' increases slightly to the extent that the product of that industry is included in the consumption basket. But this increase is the same for all workers in their dual role as consumers, not just workers within the productivity increasing industry.

3.2 The Trilemma: From Baumol to Iversen & Wren

The post-industrial trilemma draws heavily upon the work of economist William Baumol (1967; et. al. 1985). Baumol adopts a particular conceptualisation of post-classical mark-up pricing. Business managers calculate prices to achieve target levels of return after covering costs. Reacting against marginalism, such theories have a long, empirically grounded, history including Gardiner Means' (1935, 1936) *administered prices*, Hall and Hitch's (1939) and Andrews' (1949) *normal cost pricing* and Kalecki's later work on *mark-up pricing* (1954, 1971) (Lee, 1998: 6-7). This is not the source of our disagreement with post-industrial theory as there is strong historical evidence for mark-up pricing, with firms using assumptions of volume to be sold, and differing in their pricing decisions based on the type of cost-accounting and target returns used (Lee, 1998: ch.11). However, Baumol puts forward a very particular version of mark-up pricing, which we contest because of his overly strong claims; first, that productivity increases are necessarily captured by the sector in which they appear as increased nominal productivity (value-added per worker at current prices), and second, that this surplus or 'rent' is captured by workers in that sector.

Unpacking the model further, Baumol makes four assumptions. First, he categorises economic activity into two sectors; a productivity increasing progressive (mainly traded manufacturing) sector, benefitting from 'innovations, capital accumulation, and economies of large scale', and an inherently (alternatively 'asymptotically') stagnant sector (mainly untradeable services). Second, he assumes unit cost of output to be proportional to the average quantity of labour input per unit. Third, wage movements in the two sectors are assumed to be linked due to mobility of labour. Fourth, money wages are assumed to increase at the rate of productivity increases in the progressive sector due to the power of unions (Baumol, 1967: 415-19).ⁱ

By assuming that wages in the progressive sector grow at the rate of productivity, Baumol implicitly also assumes that unit prices in this sector remain stable. No productivity increases are passed to consumers as lower prices. Hence, nominal productivity in the sector, output per worker at current prices, increases at the rate of real productivity growth. Finally, wage increases adopted by the stagnant sector through a combination of labour mobility and union organisation cause a 'cost disease' as the cost and price per unit of this sector will 'rise without limit'. The consequence for employment in both sectors depends upon price and income elasticities of demand. Baumol's conclusion was that although certain services, such as retail and higher education, are price inelastic and income elastic, other services, particularly labour intensive ones, would ultimately be priced out of the market (1967: 420-422).

Iversen and Wren infer their trilemma by altering Baumol's third assumption. Rather than assuming that wage increases are transmitted from progressive to stagnant sectors, they suggest that sectoral wage increases must necessarily diverge, limited by the technologically determined productivity increases in each sector. The cost of attempting to maintain wage-

equalisation will either be lower employment levels as new service employment is priced out of corporatist market economies, or rising tax burdens, budget deficits or inflation which they predict for Scandinavian 'social democratic' welfare states (Iversen and Wren, 1998: 512-13). Their reasoning has the somewhat strange implication that product prices at some point in time, *prior* to differential productivity increases, are in equilibrium and that any deviation in relative prices from this cannot be absorbed by product markets. Wren et al. (2013) retain this constraint relating sectoral wages to technologically determined productivity increases. They suggest that the resulting trilemma still holds for 'non-dynamic service sectors'. However, by adding a high productivity growth, internationally tradable 'dynamic service sector' they soften the choices that countries face by arguing that growth in these industries is skill rather than cost constrained. This, they suggest, may either be solved through increasing personal incentives to invest in education, created by greater wage inequality at the top of the distribution, or by combining relatively solidaristic wages with increased public-sector investment in education. They argue that the 'public sector route' may be less likely to lead to spiralling taxation or deficits because the dynamic service sector may be taxed and will provide aggregate demand benefits. Although several of the steps in this argument are contestable, we welcome the re-engagement with the state in potentially shaping and distributing market-generated outcomes, an argument which we develop further in section 5. We continue to disagree, however, with the underlying theoretical assumption that the sectoral potential for real productivity growth determines the limits of the possible when it comes to welfare capitalism. It is telling that two of the three service industries which Wren et al. categorise as 'dynamic', Finance and Business Services, were actually found to have been *low* productivity growth by Jorgensen and Timmer (2011), only Communication services were categorised within high productivity growth Information

Communication Technologies (ICT) production (see section 4.2). In the framework which we propose, sectors' economic performance is at least as much to do with pricing power as it is with productivity growth.

3.3 General Post-Classical Theory: Power Over Rents

From a post-classical perspective there is no reason to assume, as Iversen & Wren do, an automatic transmission from real to nominal productivity growth, returns to capital, and wages within a sector. With lineage to Veblen's (1921; see also Nitzan and Bichler, 2009: ch. 12) distinction between business and industry and the role of business power in determining pecuniary performance, more recent theories highlight power over rents in determining the economic product generated by firms and sectors. One strand from business studies does so by asking how competitive advantage is achieved. Another, from development studies, suggests how firms are able to generate 'rents'. The 'global value-chains' (GVCs) literature is a natural extension of this, reflecting the recent trend for production to be vertically fragmented into discrete tasks, performed across multiple locations and co-ordinated by a lead firm. Key contributions have attempted to answer why certain *activities* are able to capture the greatest value-added. Rents have also attracted interest within the broader political economy literature. Examining the US, Stiglitz (2012), Pierson and Hacker (2016) and Schwartz (2016) are concerned by the consequences of rent-seeking by corporations, their senior management and financial investors upon inequality, economic growth and political stability.

Whilst the business strategy literature differs in emphasis over whether firm performance is best explained by the possession of unique resources (Penrose, 1995; Wernerfelt, 1984) or

the environment operated within (Porter, 1980 [2004]), common ground exists with the development literature that the achievement of rents is commonplace and depends upon Schumpeterian barriers to entry (e.g. Bain, 1956). For Kaplinsky, anything allowing firms to construct barriers to entry 'decommodifies' output and enables the generation of rent (Gibbon et. al., 2008: 331),ⁱⁱ These include resource rents (access to scarce inputs), organisational, human resource, technology, and product and marketing rents (arising from strategies and actions of firms), policy, infrastructure and finance rents (arising from the legal and infrastructural environment), and relational rents (arising from relationships with other firms). This framework could incorporate Christophers' (2016) and Schwartz's (2016) identification of intellectual property rights (IPRs) as a source of monopoly, plus Stiglitz's (2012) and Pierson's and Hacker's (2016) concern with the capture of political, corporate governance and regulatory processes by well-funded interest groups. The different potential sources of rent interact with one another to produce outcomes that may be relatively stable over time, explaining how non-competitive outcomes such as low intensity of competition, low supplier and buyer power and low threats of substitution can arise (Porter, 1980). In these theories, where economies are generated clearly does not only depend upon the capacity to increase real productivity.

The Global Value Chain (GVC) literature, also referred to as Global Production Networks (GPN) or its pre-cursor Global Commodity Chains (GCC) reflects the development of international trade in final products into trade in discrete tasks. This literature recognises that the realisation of nominal value-added within chains is not evenly dispersed across activities or geographies. Recent contributions have highlighted the need to move beyond standard economic theories of trade and outsourcing such as comparative advantage and transaction cost theory to consider power within GVCs. Key to this is the strategy of lead

firms operating in oligopolistic market structures contracting with suppliers in highly competitive markets. This allows lead firms to achieve significant mark-up over costs, increasing nominal productivity and profit share not by raising prices to western consumers but by squeezing input costs and the margins of suppliers (Milberg and Winkler 2013; Schwartz 2016).

It is implied in *power over rents* theory that the highest returns to labour and capital are likely to occur where the greatest nominal levels of productivity are achieved. Indeed, much of the GVC literature has been concerned with labour conditions and remuneration in parts of value chains located in developing countries but ultimately supporting Western consumers and the profitability of Western corporations (e.g. Lane and Probert, 2009; Millberg, 2008; Palpacuer, 2008). However, there has been little focus upon the role of the state in influencing the generation and distribution of rents within national economies. This is, however, the focus of another set of analytical models developed in Scandinavia to inform coordinated wage bargaining, and which more or less explicitly rest on power over rents theory (SOU, 1955; Aukrust, 1970; 1977; Edgren, Faxén & Odhner, 1973; LO, 1951; Faxén, Odhner Spånt, 1988; 1989). These have at different periods and to varying degrees influenced practice in post-war Scandinavia. But it is primarily their theoretical focus upon bringing public power to bear on the sustainable generation and distribution of rents that deserves our attention. The two latter - Rehn-Meidner and FOS models - are explicitly grounded in 'Stockholm School'-theory, rejecting equilibrium-analysis in favour of a conception of growth dependent upon rent-generating innovations and dynamic disequilibria (Lundberg & Henriksson, 1994).

4. Empirical Analysis

4.1 Hypotheses

The essential difference between the theories discussed concerns the role of pricing power in addition to productivity growth in determining nominal productivity and how this relates to wages. (It is an accounting identity that changes in nominal productivity are a consequence of changes in real productivity and price)ⁱⁱⁱ

Competitive neoclassical theory suggests an absence of pricing power in every sector, with real productivity increases *offset* by price decreases to leave no change in nominal productivity. Wages are not determined by sectoral performance and are consequently uncorrelated with changes in productivity or price.^{iv}

In Baumol's model, progressive sectors exhibit pricing power through stable price indices as real productivity increases. This increases nominal value-added productivity which is captured by workers in the form of higher wages. Stagnant sectors with no (or low) productivity increases have to manage wage inflation transmitted from the progressive sectors, resulting in increasing unit costs, output prices and hence nominal productivity. This is Baumol's famous cost disease.

Iversen's and Wren's trilemma removes wage transmission between sectors from Baumol's model and as a constraint for achieving high employment and fiscally sustainable economies, imposes the condition that unit costs and output prices are stable in every sector. This ensures that real productivity growth is the only determinant of nominal productivity growth and wage growth.

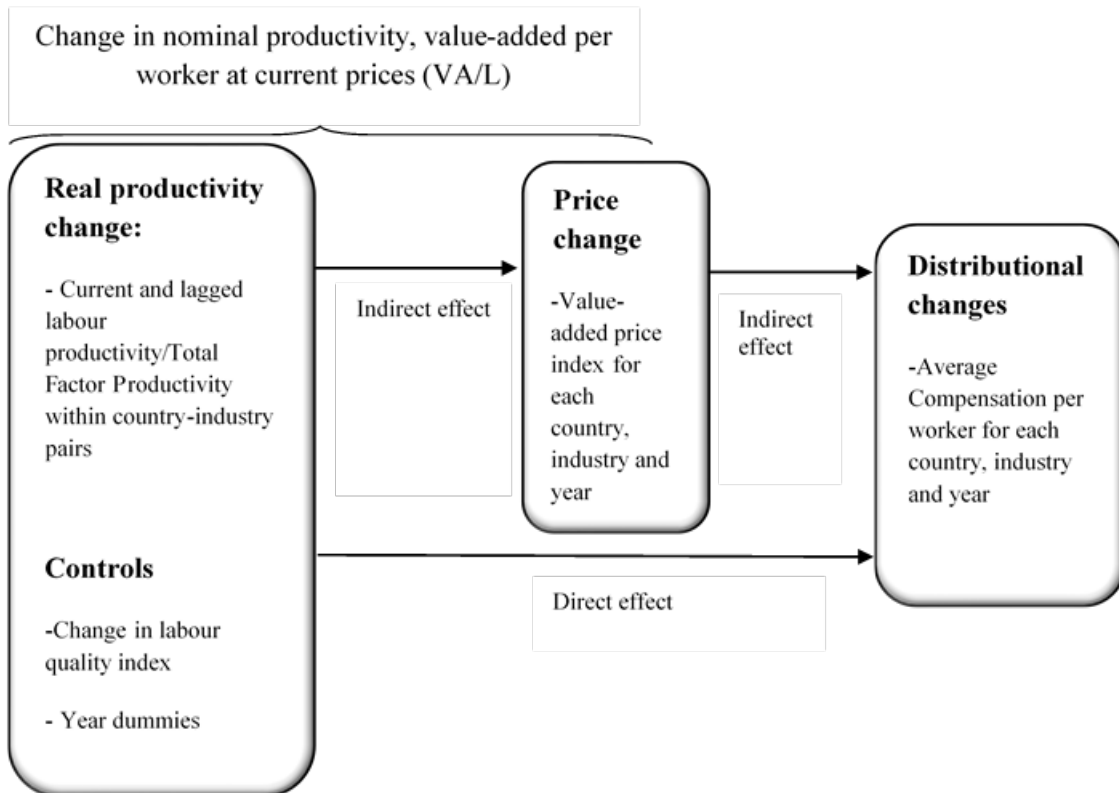
Power over rents theory suggests that pricing power differs by sector: Those with defensible positions have stable (or increasing) price indices and can convert a greater proportion of real productivity increases into nominal increases, whilst those in more commodified sectors cannot. While distributive implications are less prescriptive, wages are likely to correlate with changes in nominal productivity.

Following this discussion, the crucial sectoral relationships to examine empirically are whether:

- i) An increase in real productivity is associated with a change in the value-added price index (VAPI).
- ii) An increase in real productivity is associated with increased labour compensation.
- iii) An increase in the VAPI is associated with increased labour compensation

Figure 1 illustrates the suggested relationship between the variables.

Figure 1 - Illustration of the potential causal mechanisms between changes in productivity and value-added price indices, which together constitute changes in nominal productivity, and changes in average compensation



The answers to these questions will indicate the extent to which sectoral pricing power and real productivity increases are intertwined in influencing wage increases. This has important consequences for the theoretical framework through which we view post-industrial economies, and, as discussed in section 5, our understanding of the possibilities for welfare capitalism.^v

4.2 Dataset and variable construction

The dataset used is EU-KLEMS (March 2011), which provides standardised industry-level data from national accounts for EU-25, Australia, Korea, Japan and the USA. Data are available annually from 1970 until 2007 for EU-15, Australia and Korea; from 1995 until

2007 for the EU-10 accession countries; from 1973 for Japan and 1977 for the USA. Industries are excluded where, due to their non-market nature, there is no agreed measure of real productivity, including health, education and public administration (see Timmer et al. 2007:47-8) We also exclude real-estate which is based on imputed rents and not an independent reflection of productivity changes. The resulting twenty-three two-digit industries were selected to ensure a high degree of cross-country coverage.

This dataset contains gross value-added price and volume indices derived from national accounts.^{vi} The Paasche value-added price indices are calculated annually and chain-linked using detailed price series on inputs and outputs weighted by value (expenditure) series. The Laspeyre or Tornquist volume indices are derived, in approximately 85% of series, by deflating value data using the price indices. In the remaining 15%, volume series are constructed directly and weighted by the annual price structure. These indices are also chain-linked and therefore fix the structure of prices to calculate volume changes for a year at a time (Lequiller and Blades 2006, ch.2).

The real labour productivity variable was constructed by dividing the volume indices by the number of persons engaged in each industry, taking the natural logarithm, and then calculating the difference between each year. Taking logs is common in wage equations (Martins, 2007: 24) and transforms multiplicative functions into additive ones. As a robustness check we examined the effect of using total factor productivity (TFP) rather than labour productivity, but this reduced the number of countries analysed to eighteen due to the limited availability of capital-stock series.

Average industry compensation, our proxy for 'wage', is calculated by dividing nominal labour compensation in national currency by the number of employees in each industry.

Average industry-level compensation is, by definition, calculated across a range of workers with different skills, performing different roles organised by different occupations.^{vii}

In the labour compensation regressions we measure the effect of changes in a labour quality index, calculated in EU-KLEMS based on the average level of educational achievement of workers in each industry. This is from estimates of the proportion of total hours worked by workers with each level of educational achievement in each industry (O'Mahony and Timmer, 2009).

Following the method used by O'Mahony and Peng, each observation is weighted according to the average employee compensation share of each industry over the available period. This is a standard approach in the literature to take account of industry heterogeneity (O'Mahony and Peng 2008; see also Kahn and Lim, 1998).

To analyse broad changes in the economy, we retain the twenty-three two digit industries in the EU KLEMS database but group them into a smaller set of sectors. These sectors are representative of similar patterns of productivity growth and structural change as identified by Jorgenson and Timmer (2011). Following their categorisation we focus on six sectors: ELECOM (ICT production), MexELEC (manufacturing excluding ICT), OtherG (other goods production including agriculture, construction, mining and utilities), DISTR (distribution services), FINBU (finance and business services) and PERS (personal services). Table 1 provides the precise definition of each group in terms of the NACE rev. 1 industry classification scheme. There were some differences found between the EU, US and Japan between 1980 and 2005, however, FINBU and PERS were universally the lowest productivity growth, DISTR exhibited high and ELECOM the highest productivity growth (Jorgenson and Timmer 2011: table 4).

Table 1. Description of sectors

Description	Abbreviation	NACE rev. 1
		code
ICT-PRODUCTION (incl. electrical machinery manufacturing and post and communication services)	ELECOM	30–33 and 64
MANUFACTURING (excl. electrical machinery)	MexELEC	15–29 and 34–37
OTHER PRODUCTION (incl. agriculture, mining, utilities and construction)	OtherG	A–C and E–F
DISTRIBUTION (incl. trade and transportation)	DISTR	50–52 and 60–63
FINANCE AND BUSINESS SERVICES (excl. real estate)	FINBU	J and 71–74
PERSONAL SERVICES (incl. hotels, restaurants, community, social and personal services)	PERS	H, O, and P
GOODS PRODUCTION	ELECOM + MexELEC + OtherG	
MARKET SERVICES	DISTR+FINBU+PERS	

4.3 Analysis and Findings

4.3.1 Reduced form wage equation

As a first approximation of the effects of changes in real labour productivity and the VAPI upon labour compensation we use a reduced form fixed-effect model (equation 1). This reduced form regression provides a simple and direct impression of the relationship between variables but assumes that the independent variables are exogenous, i.e. they are

determined autonomously outside of the model. This is likely to be unrealistic as the value-added price index may be affected by changes in productivity in our framework and there is also the potential for reverse causation, i.e. that changes in compensation could effect productivity and prices. Therefore we subsequently undertook simultaneous structural equation modelling, allowing the value-added price index to be an endogenous variable, mediating the effect of changes in productivity upon wages (Zellner and Theil 1962) (see figure 1).

$$\ln W_{cit} = \beta_0 + \beta_1 \ln LP_{cit} + \beta_2 \ln LP_{ci(t-1)} + \beta_3 \ln VAP_{cit} + \beta_4 \ln LQI_{cit} + \eta_{ci} + Y_t + \eta_{cit} \quad (1)$$

The subscripts represent country c , industry i and year t , so $\ln W_{cit}$ is log form average labour compensation in the industry i of country c in year t . $\ln LP_{cit}$ is log form labour productivity for country, industry and year and $\ln LP_{ci(t-1)}$ for country, industry and one year previously; $\ln VAP$ is the log form VAPI; $\ln LQI$ is log form labour quality index; η_{ci} is a vector of country-industry pair fixed effects to control unobserved heterogeneity; Y_t are year dummies to control time dynamics, and η_{cit} is the stochastic error term. Following Islam (1995) and Durlauf et al. (2005), we can first difference equation (1) to produce the wage growth equation:

$$\begin{aligned} d\ln W_{cit} = & \beta_0 + \beta_1 d\ln LP_{cit} + \beta_2 d\ln LP_{ci(t-1)} + \beta_3 d\ln VAP_{cit} + \beta_4 d\ln LQI_{cit} + Y_t \\ & + \eta_{cit} \quad (2) \end{aligned}$$

The difference of the log form wage is approximately its annual growth rate. The country-industry pair fixed effects (η_{ci}) are differenced out of the model, while year dummy variables capture potential year fixed effects operating across all industries and countries that might

influence the relationship between the variables being examined. We did not change the constant and stochastic error term for simplicity. The results for each group of industries are shown in table 2. The coefficients may be interpreted as the percentage change in labour compensation for a 1% change in each independent variable. The standard errors are shown below each coefficient.

These results only provide a partial and approximate indication of the mechanisms discussed in section 3. However they suggest that changes in labour compensation are related to changes in industry and sector nominal productivity. Increases in the VAPI are at least as significant as real productivity increases in every sector except finance and business services where they are slightly smaller. As a robustness check we substituted TFP for each of the Labour Productivity terms in equation (2). The results are similar (see Appendix 1). To better examine the postulated mechanisms, we now turn to the structural equation modelling.

Table 2 - Estimation of wage growth regression using the reduced form equation (2), six sectors, between 1970 and 2007

	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
dlnLP _{cit}	0.378*** <i>0.007</i>	0.451*** <i>0.023</i>	0.351*** <i>0.009</i>	0.299*** <i>0.019</i>	0.447*** <i>0.026</i>	0.364*** <i>0.032</i>	0.794*** <i>0.025</i>
dlnLP _{ci(t-1)}	0.024*** <i>0.006</i>	0.058*** <i>0.019</i>	0.028*** <i>0.008</i>	0.026 <i>0.018</i>	-0.011 <i>0.023</i>	0.032 <i>0.028</i>	0.012 <i>0.023</i>
dlnVAP _{cit}	0.425*** <i>0.007</i>	0.483*** <i>0.027</i>	0.443*** <i>0.01</i>	0.306*** <i>0.016</i>	0.617*** <i>0.024</i>	0.298*** <i>0.024</i>	1.002*** <i>0.024</i>
dlnLQI _{cit}	- 0.044*** <i>0.009</i>	-0.128*** <i>0.032</i>	-0.173*** <i>0.012</i>	-0.024 <i>0.024</i>	0.067* <i>0.036</i>	0.057 <i>0.037</i>	-0.019 <i>0.029</i>
Year							
dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.509	0.524	0.572	0.398	0.684	0.467	0.722
N	12095	1064	5320	2128	1064	1064	1455

Notes: Each cell reports the coefficients and the estimates of standard errors (*italic*). ***, ** and * indicate a p value of ≤ 0.01 , 0.05, 0.10 in a two-tailed test.

4.3.2 Simultaneous structural equation model

Following the discussion in section 4.1, (represented in Figure 1), the total effect of changes in real productivity on labour compensation can be decomposed into a direct effect and an indirect effect that operates through changes in the value-added-price index. Equation (3) captures the direct effect of real and one-year lagged productivity increases upon labour compensation. Equation (4) estimates the first stage of the indirect productivity effect, measuring the effects of changes in real and one-year lagged real labour productivity upon the VAPI.

$$d\ln W_{cit} = \beta_0 + \beta_1 d\ln LP_{cit} + \beta_2 d\ln LP_{cit-1} + Y_t + \eta_{cit} \quad (3)$$

Equation (5) examines the second stage of the indirect effect of productivity changes upon wages by estimating the effect of change in the VAPI upon labour compensation while controlling for labour quality. The combination of equations (4) and (5) represent the total indirect price effect of changes in productivity upon labour compensation. All calculations are performed for industries grouped into sectors (as shown in table 1) and combined as ‘total’.

$$d\ln VAP_{cit} = a_0 + a_1 d\ln LP_{cit} + a_2 d\ln LP_{ci(t-1)} + Y_t + \varepsilon_{cit} \quad (4)$$

$$d\ln W_{cit} = \gamma_0 + \gamma_1 d\ln VAP_{cit} + \gamma_2 d\ln LQI_{cit} + Y_t + u_{cit} \quad (5)$$

Equations (3)-(5) comprise a simultaneous equation system (SEM), allowing the simultaneous estimation of the relationship between changes of real productivity, price and wages as suggested in figure 1 within different country-industry groups while modelling co-variation amongst them. For simplicity, the 1970-2007 year dummies have been aggregated into four decade dummies. Since the data may not be normally distributed, maximum likelihood methods have been employed (Distefano, 2002). Tables 3 and 4 show the results of equations 4 and 5 respectively. Table 5, panel 5a, shows the direct productivity effect of equation 3. Panel 5b combines the results of equations 4 and 5 into the indirect productivity effect. Panel 5c combines direct and indirect effects of 5a and 5b into a total productivity effect. The results of a number of standard statistical tests for this SEM are shown at the bottom of table 5, with all tests passing comfortably.

Table 3: Relationship between changes in real productivity and the value-added price index by sector, corresponding to equation (4)

$d\ln VAP_{cit}$	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
$d\ln LP_{cit}$	-0.299*** <i>0.008</i>	-0.272*** <i>0.025</i>	-0.265*** <i>0.011</i>	-0.341*** <i>0.021</i>	-0.295*** <i>0.028</i>	-0.215*** <i>0.031</i>	-0.233*** <i>0.018</i>
$d\ln LP_{ci(t-1)}$	-0.059*** <i>0.007</i>	-0.144*** <i>0.024</i>	-0.024** <i>0.011</i>	-0.034* <i>0.021</i>	-0.013 <i>0.028</i>	-0.033 <i>0.028</i>	-0.070*** <i>0.017</i>
Decade dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12095	1064	5320	2128	1064	1064	1455

Notes: Each cell reports the coefficients and the estimates of standard errors (italic). ***, ** and * indicate a p value of ≤ 0.01 , 0.05, 0.10 in a two-tailed test.

It is clear from the SEM that increases in real productivity have a statistically significant negative effect on the value-added-price index in every sector (table 3). This seems most consistent with an imperfectly competitive neoclassical or power over rents framework. In Baumol's model we would expect price *increases* in more stagnant service sectors, and in Iversen and Wren's trilemma stable prices across all sectors. The smallest decreases in price occurred in Finance and Business services and Personal services. This may be due to the relative pricing power of those sectors with international competition at the point of delivery more limited and prices less transparent than for tradable manufacturing and distribution sectors. Productivity increases are still having a negative effect upon price indices a year later in all sectors, statistically significant and largest in the manufacturing sectors, particularly the ICT sector, and in personal services. This may indicate the potential for ongoing reduction in costs of productivity increases in these sectors, partially passed on to consumers in lower prices.

Table 4: Relationship between changes in the value-added price index and labour compensation by sector, corresponding to equation (5)

$d\ln W_{cit}$	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
$d\ln VAP_{cit}$	0.435*** <i>0.008</i>	0.487*** <i>0.028</i>	0.490*** <i>0.012</i>	0.284*** <i>0.018</i>	0.672*** <i>0.027</i>	0.228*** <i>0.027</i>	0.985*** <i>0.021</i>
$d\ln LQI_{cit}$	-0.160*** <i>0.009</i>	-0.054 <i>0.034</i>	-0.210*** <i>0.012</i>	-0.174*** <i>0.028</i>	-0.107*** <i>0.037</i>	-0.143*** <i>0.040</i>	-0.026 <i>0.019</i>
Decade							
dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12095	1064	5320	2128	1064	1064	1455

Notes: Each cell reports the coefficients and the estimates of standard errors (italic). ***, ** and * indicate a p value of ≤ 0.01 , 0.05, 0.10 in a two-tailed test.

Contrary to neoclassical economics and absent from Iversen's and Wren's trilemma, a general post-classical framework would expect increases in the VAPI to be associated with increases in average wages due to its role in increasing nominal productivity. The fact that this effect is positive and statistically significant across all sectors and the total economy (table 4) lends support to this framework. Changes in the labour quality index, however, have a negative effect upon wages, the opposite of what we would expect. This has been observed in other studies and may be due to an over-supply of educated workers with subsequent credential inflation in hiring for many low-level roles, particularly for younger workers (Lacuesta et al., 2011)

Comparing the effect of increases in productivity and the VAPI upon wages we can see that the price effect (table 4) is greater than the direct productivity effect (panel 5a) for every sector except finance and business services where they are almost equal. Because the indirect effect of productivity increases acting through the VAPI is negative (panel 5b), this means that the price effect is greater still than the total productivity effect (panel 5c). The ongoing direct effect of lagged productivity increases upon wages seems to be largely insignificant (panel 5a), although continuing to operate negatively through its effect upon the VAPI (panel 5b).

Table 5: Relationships between real productivity, value-added price index and wage, equation(3)-(5)

Panel 5a direct effect of real productivity on wage, equation (3)							
dlnW _{cit}	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
dlnLP _{cit}	0.394*** <i>0.007</i>	0.376*** <i>0.024</i>	0.406*** <i>0.010</i>	0.238*** <i>0.019</i>	0.475*** <i>0.027</i>	0.249*** <i>0.030</i>	0.906*** <i>0.016</i>
dlnLP _{ci(t-1)}	0.012* <i>0.007</i>	0.098*** <i>0.022</i>	0.016* <i>0.009</i>	-0.018 <i>0.017</i>	0.035 <i>0.024</i>	0.008 <i>0.025</i>	-0.030** <i>0.014</i>
Panel 5b indirect effect of real productivity on wage, equations (4)-(5)							
dlnW _{cit}	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
dlnLP _{cit}	-0.130*** <i>0.004</i>	-0.132*** <i>0.014</i>	-0.130*** <i>0.006</i>	-0.097*** <i>0.008</i>	-0.198*** <i>0.020</i>	-0.049*** <i>0.009</i>	-0.230*** <i>0.018</i>
dlnLP _{ci(t-1)}	-0.026*** <i>0.003</i>	-0.070*** <i>0.012</i>	-0.012** <i>0.005</i>	-0.010* <i>0.006</i>	-0.009 <i>0.019</i>	-0.008 <i>0.007</i>	-0.069*** <i>0.017</i>
Panel 5c Total effect of real productivity on wage, equations (3)-(5)							
dlnW _{cit}	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
dlnLP _{cit}	0.263*** <i>0.008</i>	0.244*** <i>0.026</i>	0.276*** <i>0.011</i>	0.141*** <i>0.019</i>	0.276*** <i>0.032</i>	0.200*** <i>0.030</i>	0.676*** <i>0.023</i>
dlnLP _{ci(t-1)}	-0.014** <i>0.007</i>	0.028 <i>0.024</i>	0.004 <i>0.010</i>	-0.027 <i>0.018</i>	0.026 <i>0.031</i>	0.000 <i>0.026</i>	-0.098*** <i>0.022</i>
Decade dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12095	1064	5320	2128	1064	1064	1455
RMSEA	0.042	0.059					
SRMR	0.006	0.008					
CFI	0.998	0.996					
TLI	0.971	0.952					

Notes: Each cell reports the maximum likelihood coefficient and the estimates of standard errors (in italic). ***, **and * indicate a p value of ≤ 0.01 , 0.05, 0.10 in a two-tailed test.

RMSEA: Root mean squared error of approximation; SRMR: Standardized root mean squared residual; CFI: Comparative fit index; TLI: Tucker-Lewis index. These two SEM for the total sample and six industry groups show a good fit. The RMSEA fit is close (0.042, 0.059 < 0.06). A perfect fit corresponds to an SRMR of 0, and a good fit corresponds to a “small” value, considered by some to be limited at 0.08. The model fits well by this standard (0.006, 0.008). CFI (0.998, 0.996) and TLI (0.971, 0.952) indicate a good fit as they are more than 0.95.

As a robustness check we substituted TFP for labour productivity, for the more limited group of 18 countries with very similar results (Appendix 2). Increases in total factor productivity reduce the VAPI across every sector. Changes in TFP, and the VAPI, continue to

have a statistically significant positive effect upon labour compensation. The price effect on labour compensation is greater than the total factor productivity effect by 233% (0.287/0.123) (Appendix 2.2/Appendix 2.3c), compared with 165% (0.435/0.263) (Table 4/Table 5c) for labour productivity. Finance and business services is the only sector where the TFP effect is actually larger than the price effect on wages (0.215/0.184), an enhancement of what was observed with labour productivity. We believe that this is due to the pricing power of the sector to convert real productivity increases into nominal rather than passing them on as price savings and potentially measurement challenges in the accurate separation of real productivity and price changes.

5. Discussion and Conclusions

The results on wage determination are consistent with post-classical rather than competitive neo-classical theory with effects being observed at an industry/sectoral level. This is consistent with a power over rents framework including Baumol's model and Iversen & Wren's trilemma. However, evidence suggests that real productivity increases are only part of the mechanism whereby sectors generate economies. The other part is pricing power over suppliers and consumers, measured as the value-added price index. Notably, real productivity increases do not benefit the sectors where they occur without pricing power.

Evidence does not support Iversen and Wren's iron law that has been so foundational to understandings of the 'limits of the possible' for welfare capitalism, because where

economic product is generated is not determined by the inherent properties of products and services. Similarly, economic gains are not automatically distributed within or between sectors. Assuming either a cost disease related to automatic wage transmission, or advocating policy restraint that links sectoral wages to real productivity growth ignores the role of power in generating rents and determining their distribution. Once the role of power is acknowledged, it is again legitimate to revisit questions about how socio-political decisions may intervene in these power relations to shape and distribute market-generated outcomes.

Models of wage formation developed in Scandinavia, having informed practice to varying degrees, focus on how state and collective bargaining power may intervene in the generation and distribution of rents. They recognise that certain sectors, particularly those competing in global markets, often generate greater rents than others. These must be competitive. Having wages determined nationally can aid this whilst full employment commitments preclude 'low road' strategies based on cost competition. Successful firms are those that achieve high levels of nominal productivity, where real productivity growth is only one of the complex sources of rents as discussed. Here, national wage agreements prevent wage drift allowing large surpluses to be generated, while the uncompetitive succumb under 'transformation pressure', freeing resources to the higher nominal productivity sectors (Erixon, 1994). Hence, wage determination becomes endogenous to securing future rents and conditions for growth. Some of the rents achieved in the competitive sector are then redirected to the public sector through National Agreements on wages and taxation, and anchored in the wage and employment structure that these Agreements establish. An important premise, accepted by all parties, is that the public

sector generates positive externalities by supporting families in their important reproductive role, and contributes to generating competitive advantage within national systems of innovation (Mahon, 2007).^{viii} Though real economies differ from analytical models, as Häusermann's and Palier's (2008) findings suggest, there is no reason to preclude the enduring viability of this strategy.

Private consumer services face higher wage costs from such National Agreements than in liberalised labour markets, resulting in relatively higher prices for these and lower demand *ceteris paribus*. However, certain mechanisms may reduce costs. A large co-operative sector (especially in real estate)^{ix} may actively constrain mark-ups over production costs (Pestoff, 1991). Another is the transparency of the rate of return on capital within national wage negotiations with incentives to agree rates high enough to ensure continued capital investment supporting employment but capped to ensure a fair distribution of economic rents between sectors and classes.^x Third, relatively high wage costs encourage systems of working involving training, organisation and the use of capital equipment to maximise productivity. Despite these countervailing mechanisms, relative costs of consumer services are likely to be higher than in liberal welfare regimes. But this need not cause (and in Scandinavian practice has not caused) a crisis of demand and employment. Demand depends upon disposable income and, as the cost of imported consumer goods has been deflationary, a greater proportion of income is available for domestic services. Similarly, higher levels of earning equality mean a broader base of participation in consumption. However much smaller this sector of the economy may become, it will be compensated for by the larger public sector, funded by the partial redistribution of rents from the successful competitive sector.

What of Pierson's inference that growth will fall towards zero in post-industrial societies, necessitating the retrenchment of welfare states? It is beyond the scope of this paper to examine the expenditure side of Pierson's argument in terms of the extent to which welfare state commitments are anticipated to rise. We do not dispute, either, that productivity and output growth has, on average, slowed in OECD economies over the last three decades (Milberg and Winkler, 2013: 159, table 5.1). However, it is far from agreed that long-run secular stagnation is a necessary outcome.

A large literature in macroeconomics has in recent years developed models which reconcile the empirically observed 'stylised facts' of "balanced growth", one of which is roughly stable long-run per capita real growth (Kongsamut et al., 2001: 870)^{xi}, with the long-run stylised facts of structural transformation. As Herrendorf et al. (2014) note and survey, there are a number of different mechanisms, not necessarily mutually exclusive, for explaining structural change while ensuring it remains consistent with balanced growth.

Whether structural change is explained through recourse to differential technological change (Baumol, 1967; Ngai and Pissarides, 2007), changing demand from rising incomes (Kongsamut et al., 2001), or changing factor prices due to education and globalisation combined with different capital intensities and elasticities of substitution in production (Acemoglu and Guerrieri, 2008; Alvarez-Cuadrado et al., 2012), all of the models aim to be consistent with generalised balanced growth. Indeed even when structural change is modelled as being due to differential productivity increases across sectors, as per Baumol, the conclusion of aggregate growth falling to zero does not necessarily follow (Ngai and Pissarides, 2007).

Furthermore, there is doubt about the stagnant productivity potential assumed of all market services. Recent research has found that labour productivity has been increasing significantly in certain market services across the US and Europe since the 1990s, attributed to the ongoing ICT revolution (Inklaar, Timmer & van Ark, 2008; Jorgenson and Timmer, 2011; Triplett & Bosworth, 2004; 2006). Significant for Scandinavian post-industrialism, surprisingly high contemporary growth-rates in Sweden are due to high value-added services exports (Baccaro and Pontusson, 2016). Second, as argued above, productivity increases without pricing power do not lead to increased income in the sectors where it occurs, or increased tax revenues. This is particularly important where sectors are involved in international trade. Declining terms of trade has the potential to outweigh domestic productivity growth, causing a falling standard of living (Krugman, 1996: 7). There is evidence that this has been occurring at the supplier ends of global value chains in developing countries (Milberg and Winkler, 2013).

Hence, the causes of declining aggregate productivity growth in developed countries is likely much more complex than purely the post-industrial mix of activities. One possible avenue for future research to consider would be foregone Kaldor-Verdoorn effects, arising from inadequate and/or volatile expansion of aggregate demand, which was deemed crucial in some Scandinavian wage-formation models (Faxén, Odhner & Spånt, 1989). It is well known that macroeconomic policy in the Eurozone has prioritised price stability over growth, and lower productivity growth may have been a price to pay for this (Storm & Nasteppad, 2013), and some research suggests that growth and employment rates could have been higher in contemporary Sweden through more optimal demand-side policies (Erixon, 2015). This

applies to a lesser extent to the United States. However, its finance-led growth has on the other hand been highly volatile.

This brings us to another, though related, avenue of research concerning the financialisation of modern capitalism. Duménil and Lévy (2004) have demonstrated that the profit-share of financial activities increased from an insignificant amount in the 1970s to about 10 percent of overall value-added by 2000. For them, this explains the flat-lining of the rate of business fixed investment despite a major increase of the profit-share of value-added. A rentier stratum has emerged, diverting resources away from long-term patient capital required to promote productivity growth. Consequently, corporate governance is less oriented towards 'retaining and investing' as opposed to 'downsizing and redistributing' (Lazonick & O'Sullivan, 2000). It is not unreasonable to consider the possibility that this is detrimental to productivity growth, suggesting that the potential costs of financialisation are to the national competitiveness of other industries. The consequences of this for wage inequality and the funding of the welfare state need to be weighed against direct tax revenues from this sector by researchers and policy-makers. In turn this raises thorny questions of political will and the practical possibility for financial re-regulation, but these are not the ones posed by the post-industrial trilemma.

Financialisation could also be linked to our argument through the lens of global value chains. Downsize and redistribute, despite its possibly negative implications for productivity growth, might have offered viable business models because it has been possible for corporations to exert power over rents further down the value chain in activities outsourced to suppliers in developing countries. Hence, productivity increases have not generated higher value-added for these suppliers. Rather, intense competition between them has

resulted in lower input prices for lead firms in developed economies (Milberg & Winkler, 2013: 116-23). These lower input prices combined with stagnant real wages, resulting from the weakening position of organised labour, have allowed lead firms to increase profits (and triangulated with Duménil & Lévy above all rentier profits) while reducing product prices (Milberg and Winkler, 2013: 155-56). Deflation in consumer product prices has meant a larger proportion of disposable income is available to spend on domestic services, even with stagnant and more precarious wages. The point would be that the determination of sectoral demand is interconnected within and across economies and cannot be deduced from unit price changes relative to an assumed equilibrium at some point in time. This may be indicative of a social bargain very different from the golden age of the welfare state (see also Schwartz, 2001), where wage earners in advanced capitalist society are integrated into a low productivity finance-led capitalism to a larger extent through inexpensive private consumption goods and the availability of credit rather than public welfare services and insurance (Crouch, 2009). The implication of this for the prospects of welfare capitalism is far from evident, but questions of its prospects and desirability are about (admittedly difficult) questions of social and institutional relations, regulation of markets, macroeconomic intervention, and distribution between sectors and classes, and not about the physical properties that inhere in goods or services.

ⁱ Baumol recognises that (ii) is unrealistic and (iv) only partially realistic but suggests that they are included for ease of exposition of the model. In terms of the conclusions of the model, it does not matter whether capital costs are included, it is sufficient to note that the unit costs of the two sectors will diverge due to the labour-saving nature of the progressive sector. Similarly, it does not matter whether money wages rise at exactly the rate of productivity growth in the progressive sector, rather that wages have some correlation with productivity growth. Assumption (iii) Baumol takes to be broadly realistic in this and later work, which is the assumption that Iversen and Wren change.

ⁱⁱ Kaplinsky's concept of rent is not reducible to the neoclassical idea of a scarce factor return, in excess of the equilibrium marginal product of the factor because of its extra-productivity in particular circumstances (Alchian 1987: 142). Rather, it arises from control of scarce resources, which, following Schumpeter, may be constructed by firms in coordination with their physical and institutional environment, resulting in returns above an average

benchmark (Kaplinsky 1998: 10-13; Kaplinsky and Morris 2001: 25-6). In our view, these complex resources are irreducible to a treatment as factors of production.

ⁱⁱⁱ Change in real productivity = $\Delta Q/\Delta L$, change in nominal productivity = $[\Delta P \cdot \Delta Q]/\Delta L$, where ΔQ is change in the quantity of output produced, ΔL is change in the quantity of labour input used in production and ΔP is change in the value-added price index of the product, calculated as per unit sales price minus the price of intermediary products used in production.

^{iv} It is possible that identifying such a relationship could still be consistent with neoclassical theory, but this would require that changes in average industry productivity would have to be perfectly correlated with changes in the average level of human capital within an industry. This is not a prediction of neoclassical economics and there is no reason why such a relationship should occur as high productivity workers should be rewarded irrespective of industry worked within (Hildreth and Oswald 1997: 330).

^v We focus upon sectoral level analysis because in the literature this is where the technological propensity for productivity increases has been understood to operate. It is also the level of analysis where comparative productivity data has been compiled. We are aware of recent empirical work in economics, Barth et al. (2016) and Song et al. (2016), which has highlighted the role of establishment and firm level wage dispersion in influencing growing individual earnings inequality. However, these studies do not rule out the role of industry in influencing lower level differentials, nor do they rule out the potential role of rent-sharing between firms and workers, which our framework suggests. By having access to real productivity and value-added pricing data we are able to examine the relative significance of each of these variables upon average compensation at a sectoral level. (We would like to thank an anonymous referee for drawing our attention to this literature.)

^{vi} Although conceptually distinct, independently measuring changes in volume and price raises serious challenges. Real productivity indicates the output-volume or value-added produced by given inputs at constant prices (the number of widgets produced per person-hour). In tightly specified industries, productivity (about 15% of volume series in national accounts) may be measured directly in units of the product produced (Lequiller and Blades 2006: 47). However, the majority of volume series are derived indirectly by deflating value data by price indices, because it is easier to calculate price indices than measure volume changes directly. Especially when multiple different outputs need to be combined at higher levels of industry aggregation, the derived volume levels or changes in volume have to be weighted by their prices fixed at some point in time, or an average of prices over time. This has led critics to challenge whether national accountants can independently distinguish volume changes. Nitzan and Bichler make the point that measured changes in volume depend upon the base year of prices chosen, and these prices, also acting as weights when combining heterogeneous products and services, have to be assumed to be an equilibrium reflection of consumer utility derived from buying the products (Nitzan and Bichler 2009: 125-33). In recent years, national accountants have tried to minimise the problem of outdated prices distorting volume estimations by holding prices fixed for a maximum of one year, calculating volume changes for each year separately, and then chain-linking these changes together. This reduces more glaring distortions, but it does not deal with the fundamental critique: The price structure of the past is central to measuring a volume level or change today and acts as a series of weights for summation. If prices incorporate relative producer power, then volume changes reflect not only physical improvements in output per factor input, but also the distribution of pricing power at selected points in time. Hence, volume changes based on the most recent structure of prices are the closest that we can get to an empirical separation of price and volume. The alternative is to conclude that all that may be measured is changes in value. It means that whilst measures of volume and price change are distinct, the measure of volume change necessarily incorporates the relative prices of inputs and outputs in the previous period and therefore cannot be understood as truly independent.

^{vii} (Helwege 1992: 77-80), found that there is a significant overlap between occupations and well-defined industries, therefore pure occupational effects, independent of industry, do not have a clear meaning and should be small.

^{viii} Examples of positive externalities from the public sector include user-producer networks between the national health service and pharmaceutical companies in Sweden (Lundvall 1992), or childcare provision that the Third Way also recognises as enhancing competitive advantage by reconciling employment and the development of human capital with child-rearing and the production of a highly skilled future workforce (Giullari & Lewis 2005)

^{ix} Real estate is a major component of cost in the delivery of many consumer services and hence lower rental costs would also act to drive down producer prices.

^x The importance of these two mechanisms was stressed by a former Chief Negotiator of the Swedish Confederation of Trade Unions and State Mediator in an interview on September 27, 1993.

^{xi} Most recent models use the weaker concept of 'generalized balanced growth', which requires only that the real interest rate is constant. However, this is still consistent with the Kaldor stylised facts of constant output and capital/output ratio growth, simultaneous with structural transformation (Herrendorf et al. 2014:878-9).

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Appendices

Appendix 1 - Estimation of wage growth regression, using total factor productivity version of reduced form equation (2), six sectors, between 1970 and 2007

	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
dlnTFP _{cit}	0.259*** <i>0.008</i>	0.325*** <i>0.028</i>	0.262*** <i>0.01</i>	0.153*** <i>0.022</i>	0.373*** <i>0.03</i>	0.189*** <i>0.035</i>	0.640*** <i>0.037</i>
dlnTFP _{ci(t-1)}	0.007 <i>0.007</i>	0.016 <i>0.022</i>	0.021** <i>0.009</i>	0.014 <i>0.021</i>	-0.050** <i>0.025</i>	-0.014 <i>0.031</i>	0.02 <i>0.032</i>
dlnVAP _{cit}	0.321*** <i>0.008</i>	0.313*** <i>0.032</i>	0.352*** <i>0.011</i>	0.213*** <i>0.017</i>	0.548*** <i>0.028</i>	0.234*** <i>0.027</i>	0.924*** <i>0.033</i>
dlnLQI _{cit}	-0.064*** <i>0.01</i>	-0.199*** <i>0.039</i>	-0.190*** <i>0.014</i>	-0.121*** <i>0.026</i>	0.118*** <i>0.043</i>	-0.023 <i>0.041</i>	0.160*** <i>0.046</i>
Year							
dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.494	0.482	0.592	0.398	0.685	0.469	0.631
N	9578	854	4270	1708	854	854	1038

Notes: Each cell reports the coefficients and the estimates of standard errors (italic). ***, ** and * indicate a p value of ≤ 0.01 , 0.05, 0.10 in a two-tailed test.

Appendix 2.1 - Relationship between changes in total factor productivity and the value-added price index by sector, corresponding to the TFP version of equation (4)

dlnVAP _{cit}	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
dlnTFP _{cit}	-0.370*** <i>0.010</i>	-0.322*** <i>0.028</i>	-0.344*** <i>0.014</i>	-0.411*** <i>0.027</i>	-0.332*** <i>0.034</i>	-0.271*** <i>0.037</i>	-0.225*** <i>0.027</i>
dlnTFP _{ci(t-1)}	-0.065*** <i>0.010</i>	-0.154*** <i>0.028</i>	0.001 <i>0.013</i>	-0.079*** <i>0.027</i>	-0.050 <i>0.033</i>	-0.090*** <i>0.036</i>	0.000 <i>0.026</i>
Decade							
dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9578	854	4270	1708	854	854	1038

Notes: Each cell reports the coefficients and the estimates of standard errors (italic). ***, ** and * indicate a p value of ≤ 0.01 , 0.05, 0.10 in a two-tailed test.

Appendix 2.2 - Relationship between changes in the value-added price index and labour

compensation by sector, corresponding to equation (5) within the TFP SEM

$\text{dln}W_{\text{cit}}$	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
$\text{dlnVAP}_{\text{cit}}$	0.287*** <i>0.008</i>	0.299*** <i>0.031</i>	0.327*** <i>0.012</i>	0.201*** <i>0.018</i>	0.587*** <i>0.033</i>	0.185*** <i>0.030</i>	0.640*** <i>0.038</i>
$\text{dlnLQI}_{\text{cit}}$	-0.167*** <i>0.011</i>	-0.097*** <i>0.040</i>	-0.250*** <i>0.016</i>	-0.189*** <i>0.031</i>	-0.174*** <i>0.050</i>	-0.058 <i>0.045</i>	0.123*** <i>0.041</i>
Decade							
dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9578	854	4270	1708	854	854	1038

Notes: Each cell reports the coefficients and the estimates of standard errors (italic). ***, ** and * indicate a p value of ≤ 0.01 , 0.05, 0.10 in a two-tailed test.

Appendix 2.3 - Relationships between change in total factor productivity, value-added price index and wage, equation(3)-(5)

Panel 2.3a direct effect of TFP on wage, equation (3)

$d\ln W_{cit}$	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
$d\ln TFP_{cit}$	0.229*** <i>0.009</i>	0.273*** <i>0.028</i>	0.235*** <i>0.012</i>	0.144*** <i>0.021</i>	0.320*** <i>0.037</i>	0.266*** <i>0.035</i>	0.504*** <i>0.037</i>
$d\ln TFP_{ci(t-1)}$	0.010 <i>0.008</i>	0.006 <i>0.026</i>	0.019* <i>0.011</i>	-0.021 <i>0.020</i>	0.024 <i>0.032</i>	0.020 <i>0.032</i>	0.033 <i>0.031</i>

Panel 2.3b indirect effect of TFP on wage, equations (4)-(5)

$d\ln W_{cit}$	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
$d\ln TFP_{cit}$	-0.106*** <i>0.004</i>	-0.096*** <i>0.013</i>	-0.113*** <i>0.006</i>	-0.083*** <i>0.009</i>	-0.195*** <i>0.023</i>	-0.050*** <i>0.011</i>	-0.144*** <i>0.019</i>
$d\ln TFP_{ci(t-1)}$	-0.019*** <i>0.003</i>	-0.046*** <i>0.010</i>	0.000 <i>0.004</i>	-0.016*** <i>0.006</i>	-0.029 <i>0.020</i>	-0.017** <i>0.007</i>	0.000 <i>0.016</i>

Panel 2.3c Total effect of TFP on wage, equations (3)-(5)

$d\ln W_{cit}$	Total	ELECOM	MexELEC	OtherG	DISTR	FINBU	PERS
$d\ln TFP_{cit}$	0.123*** <i>0.009</i>	0.177*** <i>0.027</i>	0.122*** <i>0.012</i>	0.061*** <i>0.021</i>	0.125*** <i>0.040</i>	0.216*** <i>0.035</i>	0.360*** <i>0.040</i>
$d\ln TFP_{ci(t-1)}$	-0.009 <i>0.009</i>	-0.040 <i>0.027</i>	0.020* <i>0.012</i>	-0.037* <i>0.020</i>	-0.005 <i>0.038</i>	0.004 <i>0.032</i>	0.033 <i>0.035</i>
Decade dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9578	854	4270	1708	854	854	1038
RMSEA	0.000	0.069					
SRMR	0.001	0.012					
CFI	1.000	0.994					
TLI	1.000	0.917					

Notes: Each cell reports the maximum likelihood coefficient and the estimates of standard errors (in italic). ***, **and * indicate a p value of ≤ 0.01 , 0.05, 0.10 in a two-tailed test.

RMSEA: Root mean squared error of approximation; SRMR: Standardized root mean squared residual; CFI: Comparative fit index; TLI: Tucker-Lewis index. These two SEM for the total sample and six industry groups show a good fit. The RMSEA is (0.000, 0.069). The SRMR is (0.001, 0.012). A perfect fit corresponds to 0, and a good fit corresponds to a 'small' value, considered in the literature to be limited at 0.08. The model fits well by this standard. CFI (1.000, 0.994) and TLI (1.000, 0.917) indicate a good fit as they are all more than 0.9. In the output above, the Wald Chi2 tests for the coefficients equality in the 6 industry groups are reported for parameters that were not constrained to be 0. The null hypothesis is that a constraint would be valid, which are rejected for all coefficients across the groups (significant at 1% level) and suggest the industry group separation in this paper is valid.